

What is claimed is:

1. A production method for a nanomaterial comprising the steps of:
forming a template on a solid substrate using a metal oxide nanomaterial
5 forming composition comprising an organic compound with a phenolic hydroxyl group
and a molecular weight of at least 500,
forming a metal oxide layer on said template, and
removing said template to generate a metal oxide nanostructure.
- 10 2. A production method for a nanomaterial according to claim 1, wherein in said
step for forming said template, a radiation sensitive composition is used as said metal
oxide nanomaterial forming composition, and patterning is conducted using a lithography
method.
- 15 3. A production method for a nanomaterial according to claim 1, wherein in said
step for generating said metal oxide nanostructure, said solid substrate is removed
following removal of said template.
4. A production method for a nanomaterial according to claim 1, wherein in said
20 step for generating said metal oxide nanostructure, said solid substrate is removed prior
to removal of said template.
5. A production method for a nanomaterial according to claim 1, wherein in said
step for generating said metal oxide nanostructure, during removal of said template, an
25 integrated body containing both said template and said solid substrate is removed.

6. A production method for a nanomaterial according to claim 1, further comprising a step for coating at least a portion of said metal oxide nanostructure with an organic compound layer.

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7. A production method for a nanomaterial according to claim 1, wherein during said step for forming said metal oxide layer,

a step (a), in which a material containing a metal compound with a functional group that undergoes a condensation reaction with a hydroxyl group, and a functional group that can generate a hydroxyl group through hydrolysis, is brought in contact with either said template surface or a surface of a metal oxide layer formed on top of said template,

and a step (b), which is conducted after said step (a) and in which said metal compound is hydrolyzed to form a metal oxide layer,

15 are each performed at least once.

8. A production method for a nanomaterial according to claim 7, wherein in said step (a), said template surface is first subjected to preliminary oxygen plasma treatment.

20 9. A production method for a nanomaterial according to claim 1, wherein a method for removing said template uses at least one treatment method selected from a group consisting of plasma treatment, ozone oxidation, elution and calcination.

10. A production method for a nanomaterial according to claim 1, wherein said
25 organic compound has a molecular weight greater than 2000, and contains at least 0.2

equivalents of phenolic hydroxyl groups.

11. A production method for a nanomaterial according to claim 1, wherein said organic compound is a resin with a weight average molecular weight of 2000 to 30,000, comprising a unit containing a phenolic hydroxyl group and a unit containing an acid dissociable, dissolution inhibiting group, and said unit containing a phenolic hydroxyl group accounts for at least 50 mol% of said resin.

12. A production method for a nanomaterial according to claim 11, wherein said unit containing a phenolic hydroxyl group is a unit derived from hydroxystyrene.

13. A metal oxide nanomaterial forming composition comprising an organic compound containing a phenolic hydroxyl group and with a molecular weight of at least 500.

14. A metal oxide nanomaterial forming composition according to claim 13, wherein said organic compound has a molecular weight greater than 2000, and contains at least 0.2 equivalents of phenolic hydroxyl groups.

15. A metal oxide nanomaterial forming composition according to claim 13 that is a radiation sensitive composition.

16. A metal oxide nanomaterial forming composition according to claim 13, wherein said organic compound contains an acid dissociable, dissolution inhibiting group in addition to said phenolic hydroxyl group, and said composition further comprises an

acid generator.

17. A metal oxide nanomaterial forming composition according to claim 16,
wherein said organic compound is a resin with a weight average molecular weight of
5 2000 to 30,000, comprising a unit containing a phenolic hydroxyl group and a unit
containing an acid dissociable, dissolution inhibiting group, and said unit containing a
phenolic hydroxyl group accounts for at least 50 mol% of said resin.

18. A metal oxide nanomaterial forming composition according to claim 17,
10 wherein said unit containing a phenolic hydroxyl group is a unit derived from
hydroxystyrene.

19. A metal oxide nanomaterial forming composition that is used in formation of
said template in a production method for a nanomaterial according to claim 1.

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20. A template produced using a metal oxide nanomaterial forming composition
according to any one of claim 13 through claim 18.

21. A metal oxide nanostructure produced by forming a metal oxide layer on top of
20 a template according to claim 20, and subsequently removing said template.

22. A metal oxide nanostructure according to claim 21, wherein said template is
formed on a solid substrate, and said nanostructure is produced by forming a metal oxide
layer on top of said template, and subsequently removing said template and said solid
25 substrate.